

AMENDED CLAIMS

(Version with Markings To Show Changes Made)

1. A delivery system for delivering genetic material to cardiac tissue, comprising:
 - a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45 [conduction protein genetic material];
 - reservoir means for containing said recombinant nucleic acid vectors [conduction protein genetic material]; and
 - delivery means for delivering said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue;
 - wherein said delivery means comprises:
 - a catheter with a distal end having an opening at said distal end;
 - means for delivering said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir through said opening;
 - mapping electrode means positioned at said distal end of said catheter for carrying out mapping of said cardiac tissue; and
 - conductor means for connecting said mapping electrode means to the proximal end of said catheter.
4. The delivery system of claim 1, wherein said delivery means comprises a catheter with a distal end portion, and said reservoir means is located in said distal end portion.
5. The delivery system of claim 4, wherein said distal end portion comprises a hollow helical element.

6. A delivery system for delivering genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45 [conduction protein genetic material];

reservoir means for containing said recombinant nucleic acid vectors [conduction protein genetic material]; and

delivery means for delivering said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue;

wherein said delivery means comprises:

a catheter comprising a lumen for delivering said recombinant nucleic acid vectors [conduction protein genetic material] therethrough, a distal tip communicating with said lumen for contacting said plurality of cells with said recombinant nucleic acid vectors [conduction protein genetic material], and a pacing electrode.

7. The delivery system of claim 6, wherein said distal tip is a hollow helical needle tip.

8. The delivery system of claim 6, wherein said catheter is a transvenous endocardial catheter.

9. The delivery system of claim 1, wherein said reservoir contains a supply of 0.1-10 ml of said recombinant nucleic acid vectors[genetic material].

10. A delivery system for delivering genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45 [conduction protein genetic material];

reservoir means for containing said recombinant nucleic acid vectors [conduction protein genetic material]; and

delivery means for delivering said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue; wherein said delivery means comprises:

a catheter comprising a distal portion and distal tip, and wherein said reservoir means is contained in said distal portion;

means for delivering an therapeutically effective amount of said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir means and out of said distal tip; and

pacing electrode and conductor means for connecting said pacing electrode to the proximal end of said catheter.

11. The delivery system of claim 10, wherein said force means comprises a stylet.

12. The delivery system of claim 1, wherein said delivery system comprises a hollow helical screw-in element loaded with a bolus of said genetic material.

13. The delivery system of claim 12, wherein said element comprises ports for egress of said recombinant nucleic acid vectors [genetic material] into said cardiac tissue when said element is crewed into said tissue, and further comprising plugs in said ports to maintain them normally closed but which dissolve when said element is positioned within said cardiac tissue.

14. The delivery system of claim 1, wherein said recombinant nucleic acid vectors [genetic material] is DNA or RNA.

20. An implantable delivery system for delivering doses of genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45 [conduction protein genetic material];

a catheter, said catheter having a distal tip portion for engaging the cells of said cardiac tissue and delivering thereto said recombinant nucleic acid vectors [conduction protein genetic material];

reservoir means for holding said supply of recombinant nucleic acid vectors [conduction protein genetic material] and providing it to said distal tip portion of said catheter; and

delivery means for delivering a therapeutically effective amount of said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir means through said distal tip portion to said cardiac tissue;

wherein said delivery means comprises mapping electrode means or pacing electrode, and conductor means for connecting said mapping electrode means or pacing electrode to the proximal end of said catheter.

21. The system as described in claim 20, further comprising:
control means for controlling operation of said delivery means to deliver said doses.

22. The implantable delivery system of claim 21, wherein said control means comprises initiating means for initiating delivery of said recombinant nucleic acid vectors [genetic material], said initiating means comprising an external programmer.

23. The implantable delivery system of claim 21, wherein said control means comprises automatic means for automatically initiating delivery of said recombinant nucleic acid vectors [genetic material].

24. A combined mapping and delivery system for delivering recombinant nucleic acid vectors encoding a conduction protein selected from the group genetic material to cardiac tissue comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45 [conduction protein genetic material];

reservoir means for containing said recombinant nucleic acid vectors [conduction protein genetic material];

mapping means for mapping said cardiac tissue; and

delivery means within said mapping means for delivering said recombinant nucleic acid vectors [conduction protein genetic material] from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue.

25. The combined mapping and delivery system of claim 24, wherein said mapping means comprises a catheter or removable [peelable] introducer sheath having two conductor means and said delivery means comprises a catheter having a distal end portion comprising a hollow helical element.

39. The delivery system of claim 6, wherein said reservoir contains a supply of 0.1-10 ml of said recombinant nucleic acid vectors [genetic material].

40. The delivery system of claim 6, wherein said delivery system comprises a hollow helical screw-in element loaded with a bolus of said recombinant nucleic acid vectors [genetic material].

41. The delivery system of claim 40, wherein said element comprises ports for egress of said recombinant nucleic acid vectors [genetic material] into said cardiac tissue when said element is screwed into said tissue, and further comprising soluble plugs in said ports to maintain them normally closed but which dissolve when said element is positioned within said cardiac tissue.

42. The delivery system of claim 6, wherein said recombinant nucleic acid vectors [genetic material] is DNA or RNA.

48. The delivery system of claim 10, wherein said delivery system comprises a hollow helical screw-in element loaded with a bolus of said recombinant nucleic acid vectors [genetic material].

49. The delivery system of claim 48, wherein said element comprises ports for egress of said recombinant nucleic acid vectors [genetic material] into said cardiac tissue when said element is screwed into said tissue, and further comprising soluble plugs in said ports to maintain them normally closed but which dissolve when said element is positioned within said cardiac tissue.

50. The delivery system of claim 10, wherein said recombinant nucleic acid vectors [genetic material] is DNA or RNA.

AMENDED CLAIMS

Sub E¹

1. A delivery system for delivering genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45;

reservoir means for containing said recombinant nucleic acid vectors; and

delivery means for delivering said recombinant nucleic acid vectors from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue;

wherein said delivery means comprises:

a catheter with a distal end having an opening at said distal end;

means for delivering said recombinant nucleic acid vectors from said reservoir through said opening;

mapping electrode means positioned at said distal end of said catheter for carrying out mapping of said cardiac tissue; and

conductor means for connecting said mapping electrode means to the proximal end of said catheter.

D¹

Sub E²

4. The delivery system of claim 1, wherein said delivery means comprises a catheter with a distal end portion, and said reservoir means is located in said distal end portion.

D²

5. The delivery system of claim 4, wherein said distal end portion comprises a hollow helical element.

6. A delivery system for delivering genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45;

reservoir means for containing said recombinant nucleic acid vectors; and

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delivery means for delivering said recombinant nucleic acid vectors from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue;

wherein said delivery means comprises:

a catheter comprising a lumen for delivering said recombinant nucleic acid vectors therethrough, a distal tip communicating with said lumen for contacting said plurality of cells with said recombinant nucleic acid vectors, and a pacing electrode.

7. The delivery system of claim 6, wherein said distal tip is a hollow helical needle tip.

8. The delivery system of claim 6, wherein said catheter is a transvenous endocardial catheter.

9. The delivery system of claim 1, wherein said reservoir contains a supply of 0.1-10 ml of said recombinant nucleic acid vectors.

10. A delivery system for delivering genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45;

reservoir means for containing said recombinant nucleic acid vectors; and

delivery means for delivering said recombinant nucleic acid vectors from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue; wherein said delivery means comprises:

a catheter comprising a distal portion and distal tip, and wherein said reservoir means is contained in said distal portion;

means for delivering an therapeutically effective amount of said recombinant nucleic acid vectors from said reservoir means and out of said distal tip; and

pacing electrode and conductor means for connecting said pacing electrode to the proximal end of said catheter.

11. The delivery system of claim 10, wherein said force means comprises a stylet.

12. The delivery system of claim 1, wherein said delivery system comprises a hollow helical screw-in element loaded with a bolus of said genetic material.

D²
13. The delivery system of claim 12, wherein said element comprises ports for egress of said recombinant nucleic acid vectors into said cardiac tissue when said element is crewed into said tissue, and further comprising plugs in said ports to maintain them normally closed but which dissolve when said element is positioned within said cardiac tissue.

14. The delivery system of claim 1, wherein said recombinant nucleic acid vectors is DNA or RNA.

Sub E³
20. An implantable delivery system for delivering doses of genetic material to cardiac tissue, comprising:

a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45;

D³
a catheter, said catheter having a distal tip portion for engaging the cells of said cardiac tissue and delivering thereto said recombinant nucleic acid vectors;

reservoir means for holding said supply of recombinant nucleic acid vectors and providing it to said distal tip portion of said catheter; and

delivery means for delivering a therapeutically effective amount of said recombinant nucleic acid vectors from said reservoir means through said distal tip portion to said cardiac tissue;

wherein said delivery means comprises mapping electrode means or pacing electrode, and conductor means for connecting said mapping electrode means or pacing electrode to the proximal end of said catheter.

21. The system as described in claim 20, further comprising:
control means for controlling operation of said delivery means to deliver said doses.
22. The implantable delivery system of claim 21, wherein said control means comprises initiating means for initiating delivery of said recombinant nucleic acid vectors, said initiating means comprising an external programmer.
23. The implantable delivery system of claim 21, wherein said control means comprises automatic means for automatically initiating delivery of said recombinant nucleic acid vectors.
24. A combined mapping and delivery system for delivering recombinant nucleic acid vectors encoding a conduction protein selected from the group genetic material to cardiac tissue comprising:
a supply of recombinant nucleic acid vectors encoding a conduction protein selected from the group Cx40, Cx43, and Cx45;
reservoir means for containing said recombinant nucleic acid vectors;
mapping means for mapping said cardiac tissue; and
delivery means within said mapping means for delivering said recombinant nucleic acid vectors from said reservoir to said cardiac tissue so as to contact a plurality of cells in said cardiac tissue.
25. The combined mapping and delivery system of claim 24, wherein said mapping means comprises a catheter or removable introducer sheath having two conductor means and said delivery means comprises a catheter having a distal end portion comprising a hollow helical element.

SUB E4 39. The delivery system of claim 6, wherein said reservoir contains a supply of 0.1-10 ml of said recombinant nucleic acid vectors.

D4 40. The delivery system of claim 6, wherein said delivery system comprises a hollow helical screw-in element loaded with a bolus of said recombinant nucleic acid vectors.

41. The delivery system of claim 40, wherein said element comprises ports for egress of said recombinant nucleic acid vectors into said cardiac tissue when said element is screwed into said tissue, and further comprising soluble plugs in said ports to maintain them normally closed but which dissolve when said element is positioned within said cardiac tissue.

SUB E5 D5 43. The delivery system of claim 6, wherein said recombinant nucleic acid vectors is DNA or RNA.

SUB E6 48. The delivery system of claim 10, wherein said delivery system comprises a hollow helical screw-in element loaded with a bolus of said recombinant nucleic acid vectors.

D6 49. The delivery system of claim 48, wherein said element comprises ports for egress of said recombinant nucleic acid vectors into said cardiac tissue when said element is screwed into said tissue, and further comprising soluble plugs in said ports to maintain them normally closed but which dissolve when said element is positioned within said cardiac tissue.

50. The delivery system of claim 10, wherein said recombinant nucleic acid vectors is DNA or RNA.